

IN THE COMPETITION APPEAL TRIBUNAL
IN THE MATTER OF PROPOSED COLLECTIVE PROCEEDINGS
UNDER SECTION 47B OF THE COMPETITION ACT 1998
RELATING TO FOREIGN EXCHANGE RATES

THE O’HIGGINS APPLICATION (Case no. 1329/7/7/19)

BETWEEN:-

MICHAEL O’HIGGINS FX CLASS REPRESENTATIVE LIMITED
(“THE O’HIGGINS PCR”)

Applicant

and

- (1) BARCLAYS BANK PLC**
- (2) BARCLAYS CAPITAL INC.**
- (3) BARCLAYS EXECUTION SERVICES LIMITED**
- (4) BARCLAYS PLC**
- (5) CITIBANK N.A.**
- (6) CITIGROUP INC.**
- (7) JPMORGAN CHASE & CO.**
- (8) JPMORGAN CHASE BANK, NATIONAL ASSOCIATION**
- (9) J.P. MORGAN EUROPE LIMITED**
- (10) J.P. MORGAN LIMITED**
- (11) NATWEST MARKETS PLC**
- (12) NATWEST GROUP PLC**
- (13) UBS AG**

Respondents

and

- (1) MUFG BANK LTD**
- (2) MITSUBISHI UFJ FINANCIAL GROUP INC.**

Proposed Objectors

THE EVANS APPLICATION (Case no. 1336/7/7/19)

BETWEEN:-

MR PHILLIP EVANS
(“THE EVANS PCR”)

Applicant

and

- (1) BARCLAYS BANK PLC**
- (2) BARCLAYS CAPITAL INC.**
- (3) BARCLAYS EXECUTION SERVICES LIMITED**
- (4) BARCLAYS PLC**
- (5) CITIBANK N.A.**
- (6) CITIGROUP INC.**
- (7) MUFG BANK, LTD**
- (8) MITSUBISHI UFJ FINANCIAL GROUP, INC.**
- (9) J.P. MORGAN EUROPE LIMITED**
- (10) J.P. MORGAN LIMITED**
- (11) JPMORGAN CHASE BANK, N.A.**
- (12) JPMORGAN CHASE & CO**
- (13) NATWEST MARKETS PLC**
- (14) NATWEST GROUP PLC**
- (15) UBS AG**

Respondents

NEUTRAL STATEMENT OF THE O’HIGGINS PCR ON THE MERITS
as directed at the Pre-Hearing Review on 21 June 2021

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A. INTRODUCTION

1. As directed at the Pre-Hearing Review on 21 June 2021, the O’Higgins PCR has prepared this statement summarising the following matters:
 - (1) Its ‘case theory’, as detailed in its Re-Amended Claim Form and the expert reports of Professors Breedon and Bernheim (see section B).
 - (2) The sources of information which it knows or believes to exist and which it would seek to use in its analysis (see section C).
 - (3) The damages methodology which it proposes to use to capture the harm caused to the proposed class by the conduct of the Respondents, as detailed in its Re-Amended Claim Form and the expert reports of Professors Breedon and Bernheim (see section D).
2. Defined terms from the O’Higgins PCR’s previous statements of case are adopted.

B. CASE THEORY

B1. Objective

3. The O’Higgins PCR aims to recover damages for losses caused by the unlawful conduct identified in the Settlement Decisions to purchasers of relevant FX transaction services in the European Economic Area during the period from 18 December 2007 to 31 January 2013. Its ‘case theory’ has been developed so as to identify the aggregate loss suffered by that class.

B2. Scope of claim

(a) Transactions

4. As recital (9) of each Settlement Decision confirms,¹ the Respondents’ conduct related

¹ Three Way Banana Split Settlement Decision, recital (9) {MOH-A/2A/7}; Essex Express Settlement Decision, recital (9) {MOH-A/2B/7}.

to three types of customer orders:

- (1) “*Customer immediate orders*”, which are orders “*to immediately enter trades for a certain amount of currency based on the prevailing market rate*”.
 - (2) “*Customer conditional orders*” (also known as ‘limit’ or ‘resting’ orders²), which are orders “*triggered when a given price level is reached*”. Examples of such conditional orders include stop-loss and take-profit orders. A ‘stop-loss’ order is triggered when a floor price is reached, and a ‘take-profit’ order is triggered when a ceiling price is reached.
 - (3) “*Customer orders to execute a trade at a specific Forex benchmark rate or “fixing” for particular currency pairs*”, also known as ‘trading at the fix’. The ‘fixes’ affected in this case were: (i) the WM/Reuters Closing Spot Rates (the “**WMR fixes**”); and (ii) the European Central Bank foreign exchange reference rates (the “**ECB fixes**”).
5. The O’Higgins PCR’s case theory aims to recover damages for losses caused by the cartels in respect of all three such types of customer orders. This is to ensure that compensation in the form of damages is recoverable in respect of harm liable to have been caused to all (and not just some) of the members of the class by the cartels and in respect of all (and not just some) types of customer orders liable to have been caused loss by the cartels.

(b) Conduct

6. Section 4.1.2 of each Settlement Decision summarises the conduct in which the Respondents engaged as follows:
- (1) There was exchange of information between traders “*in private, mostly multilateral chatrooms and on an extensive and recurrent basis*” of “*current or forward-looking commercially sensitive information about their trading activities*” “*in accordance with a tacit understanding that: (i) such information could be used to the traders’ respective benefit and in order to identify occasions to coordinate their*

² On this terminology, see Breedon 3, paragraphs 3.8–3.12 {C/3/22-23}.

*trading; (ii) such information would be shared within the private chatrooms; (iii) the traders would not disclose such shared information received from other chatroom participants to Parties outside of the private chatrooms; and (iv) such shared information would not be used against the traders who shared it”.*³

(2) Pursuant to that underlying understanding, *“the participating traders exchanged in a recurrent and extensive fashion with each other, in mostly multilateral private chatrooms, certain current or forward-looking commercially sensitive information about their trading...”*⁴

(3) The information exchanged included:

(a) Information on open risk positions. Such information was relevant to traders’ subsequent trading decisions and its exchange enabled the participating traders to identify opportunities for coordination.⁵

(b) Information on outstanding customers’ orders.⁶ The exchange of information on limit or resting orders occurred *“frequently”* and *“on an extensive basis”* and *“eased the identification of opportunities for coordination among the participating traders”*. The exchange of information on fix positions usually took place in the hour preceding the relevant fix in order *“to identify occasions to coordinate trading at or around the fix”*. The exchange of commercially sensitive information on customers’ immediate orders *“made it easier for participating traders to identify occasions to coordinate their trading activities”*.

(c) Information on other details of current or planned trading activities.⁷ The exchange of such information *“made it easier for participating traders to*

³ Three Way Banana Split Settlement Decision, recital (47) {MOH-A/2A/12}; Essex Express Settlement Decision, recital (46) {MOH-A/2B/11-12}.

⁴ Three Way Banana Split Settlement Decision, recital (52) {MOH-A/2A/13}; Essex Express Settlement Decision, recital (52) {MOH-A/2B/12}.

⁵ Three Way Banana Split Settlement Decision, recital (53) {MOH-A/2A/13}; Essex Express Settlement Decision, recital (53) {MOH-A/2B/13}.

⁶ Three Way Banana Split Settlement Decision, recitals (54)–(55) {MOH-A/2A/14-15}; Essex Express Settlement Decision, recitals (54)–(55) {MOH-A/2B/13-15}.

⁷ Three Way Banana Split Settlement Decision, recitals (56)–(57) {MOH-A/2A/15}; Essex Express Settlement Decision, recitals (56)–(57) {MOH-A/2B/15}.

identify occasions to coordinate their trading activities”, as in the case of exchange of information concerning customers’ immediate orders.

(d) Information on bid-ask spreads.⁸ The exchange of such information was useful to other traders and “*could enable coordination of spreads*”.

(4) The Commission further identified some specific types of coordination as being facilitated by the exchange of information, namely:

(a) “*Coordinated trading with a view to affecting a fix*”.⁹

(b) “*Standing down*”, meaning refraining from trading as the trader had otherwise planned during a particular time window on account of another trader’s announced position or trading activity.¹⁰

7. The O’Higgins PCR’s case theory aims to recover damages caused by the cartels in respect of all types of conduct identified in the Settlement Decisions, including (i) information exchange of all types, and (ii) coordinated trading of all types. Again, this is to ensure that compensation in the form of damages is recoverable in respect of harm liable to have been caused to all (and not just some) of the members of the class by the cartels and in respect of all (and not just some) types of conduct identified in the Settlement Decisions.

B3. Definition of claimant class

8. The O’Higgins PCR has proposed a class definition based on identifying trades carried out by class members¹¹ which include:

(1) All three types of trades covered by the Settlement Decisions.

(2) Trading by both voice and electronic means. Although only the former was affected

⁸ Three Way Banana Split Settlement Decision, recitals (58)–(59) {MOH-A/2A/16}; Essex Express Settlement Decision, recitals (54)–(55) {MOH-A/2B/13-15}.

⁹ Three Way Banana Split Settlement Decision, recital (61) {MOH-A/2A/16}; Essex Express Settlement Decision, recitals (61) {MOH-A/2B/16}.

¹⁰ Three Way Banana Split Settlement Decision, recital (62) {MOH-A/2A/17}; Essex Express Settlement Decision, recital (62) {MOH-A/2B/16}.

¹¹ See the O’Higgins PCR Re-Amended Claim Form at paragraphs 31-33 for the class definition and its explanation {MOH-A/0/16-24}.

by the cartel conduct identified in the Settlement Decisions, the cartel conduct would have had a knock-on effect on the latter as well, as described in the damages methodology section which follows.

- (3) Trading carried out in the European Economic Area, defined with a view to limiting the affected trading to that properly within the purview of EU competition law and so caught by the Settlement Decisions.
- (4) Trading with Relevant Financial Institutions which have been identified by the O'Higgins PCR's experts as being dealers (as opposed to being themselves victims of the cartels). Although only dealers from the addressees of the Settlement Decisions participated in the cartels, for reasons explained below it is likely that harm was caused to persons purchasing FX transaction services from all dealers.

B4. Causation of loss

9. It is likely that the damages methodology developed by the O'Higgins PCR's experts and explained in section D will lead to a conclusion that every member of the class has suffered some loss, in particular because all will have suffered harm owing to the widened spreads caused by the cartels. Even to the extent that the cartels may theoretically have benefited a limited number of class members on a limited number of occasions, those class members will still be likely to have lost on average (and the methodology will seek to calculate that average/net loss to the class members as a whole).¹²

B5. Adverse selection

10. The O'Higgins PCR's damages methodology is set out in detail in section D below. It is based on a theory of harm which identifies as a core mechanism of loss the effects of adverse selection risk caused by the cartels. Harm may also have been caused (either in its own right or in conjunction with adverse selection) by directly collusive behaviour including coordinated trading and understandings to widen the bid-ask spreads. The experts' damages methodology is intended to capture harm from all of these sources. In

¹² See Bernheim 3, section III.A {C/4/15-20}; Breedon 3, paragraph 4.10 {C/3/31}.

relation to adverse selection, the O'Higgins PCR's experts explain:

- (1) An important element of an FX dealer's cost is 'adverse selection risk'. This is the risk which must be borne by the FX dealer arising from its lack of information about the entirety of the FX market.
- (2) By the information exchanges and coordinated trading described in the Settlement Decisions, the Respondents increased their rivals' adverse selection risk. In consequence, those rivals would have to react by widening their own bid-ask spreads. The consequence was that the Respondent cartelists could safely widen their own spreads without facing competitive pressure to the same degree from non-cartelist dealers. Those widened spreads represented increased prices paid by members of the class for FX transaction services provided by all FX dealers.

B6. Resultant harm

11. The cartel harm can be measured by comparing the spreads (both the effective spread and the realised spread) which would have been in place absent the cartels with those which were in fact applied:
 - (1) The effective spread measure focuses on the point in time at which the trade occurred. The realised spread measure takes into account post-trade movements.
 - (2) The comparison using the effective spread measure should, in summary, reflect the cartels' effect on adverse selection costs through raising rivals' costs.
 - (3) The comparison using the realised spread measure should, in summary, reflect the additional effect of the coordinated trading conduct identified by the Settlement Decisions.
 - (4) However, looking at the effective spread in addition to the realised spread should assist to disaggregate the effects caused by the different aspects of the cartelists' conduct and to measure the harm caused more precisely.
 - (5) The O'Higgins PCR's experts therefore propose to use both the realised spread measure and the effective spread measure.

- (6) The O’Higgins PCR’s experts will identify the cartels’ effect on realised spreads and effective spreads using regression analysis, as described further below.
12. The O’Higgins PCR’s experts’ damages methodology (see section D below) sets out a plausible means of identifying harm caused to the class and will use data which is likely to be available. Based on this methodology, which focuses on identifying classwide loss, it will be appropriate for damages to be awarded on an aggregate basis.
13. The damages will be distributed to the class in accordance with the O’Higgins PCR’s distribution plan. The approach to developing a distribution plan and distributing any settlement/damage to class members is described in more detail in the accompanying Neutral Statement on Benefit to the Class.

C. FACTUAL BASIS FOR CASE THEORY

C1. Settlement Decisions

14. The O’Higgins Application is able to rely on the European Commission’s Settlement Decisions on a ‘follow-on’ basis, such that liability is already established. The Application is restricted to being brought on a ‘follow-on’ basis only because of the constraints of CAT Rule 119. While this precludes the O’Higgins PCR from alleging that the ambit of the cartels went beyond the scope identified in the Settlement Decisions, it does not preclude the Tribunal from examining the documentary evidence to understand with greater profundity the precise nature of the infringements identified by the Commission. The O’Higgins PCR and its experts intend to do so following disclosure in order to refine and inform their analysis.

C2. Market expertise

15. The O’Higgins PCR’s analysis of the conduct identified in the Settlement Decisions is deepened and refined by a sophisticated understanding of the FX market and supplemented by other publicly available information about the FX market. In particular:
- (1) The O’Higgins PCR benefits from an expert team including Professor Breedon (an FX microstructures expert) and Reto Feller (a former FX trader and FX market

expert).

- (2) The O’Higgins PCR further benefits from the hands-on experience of Damian Mitchell (an FX trader and member of Mr O’Higgins’ advisory committee who has contributed his specialist knowledge to the development of the case¹³).
- (3) The O’Higgins PCR’s UK-based solicitor team at Scott+Scott has researched the market and analysed the publicly available information about the cartels (and information about the other materially similar FX cartel conduct) that has come into the public domain through decisions of other regulators and court proceedings in other jurisdictions, including by establishing lines of communication with those involved in other related proceedings.¹⁴
- (4) Scott+Scott UK are able to draw on the experience of their colleagues at Scott+Scott US, where class action proceedings concerning these FX cartels are well advanced with Scott+Scott US as lead claimant counsel.¹⁵ Those actions have led to a class settlement in the US with 15 banks for over \$2.3 billion. Proceedings against Credit Suisse in the US, which have not settled, are ongoing.

C3. Documentary evidence

16. It is anticipated that further information derived from disclosure will supplement the understanding of the operation of the cartel. In particular, the O’Higgins PCR anticipates that it will obtain by way of disclosure from the Respondents:

- (1) The Commission files. These will include the extensive numbers of ‘chats’ expressly relied on by the Commission in the footnotes to the Settlement Decisions that illustrate the various types of infringing conduct. In addition, it is anticipated that there will be many other transcripts of the chats that, albeit not expressly referred to in the Settlement Decisions, nevertheless exemplify the types of infringing conduct found. The O’Higgins PCR’s legal and expert teams will study the content, nature and frequency of these exchanges between the defendant

¹³ Including by way of witness evidence: see {D/5}.

¹⁴ See Hollway 4, paragraphs 82–83 {D/3/28-29}, and Hollway 5, paragraph 51 {D/7/18}.

¹⁵ See, in particular: Hollway 4, paragraphs 44–47 {D/3/15-16} and 84–85 {D/3/29}; Hollway 5, paragraphs 47–50 {D/7/17-18}; the O’Higgins Carriage Submissions, paragraphs 59 and 60 {A/4/25-26}; and the O’Higgins Carriage Reply Submissions, paragraph 132 {A/9/46}.

cartelists in order to deepen their understanding of the precise form of infringing conduct and its likely propensity to cause harm to the class via the mechanism of increased effective or realised spreads or, potentially, by other means.

- (2) Existing material which the Respondents are known to have disclosed in other related proceedings, including the US proceedings and the High Court *Allianz* proceedings.
 - (3) Trading data covering the material period of the cartels and the period after the cartels (the clean period), in respect of each defendant bank. This data is expected to include details such as trade ID, the currency pair, whether the trade was a buy or sell, and the rate.¹⁶ The data will be used to quantify damages using regression analysis as explained in the following section on damages methodology.
17. It is not impossible that the Respondents may, following disclosure, adduce factual witness evidence from traders involved in the cartels in order to explain their impact. However, the O’Higgins PCR does not assume that such evidence will be forthcoming. In any event, it is likely that the best guide to the nature and effect of the conduct will be the contemporaneous documents (i.e. the records of the ‘chats’) together with the results from the experts’ analysis of the data.

C4. Third-party data

18. It may be that third-party data repositories will also be available, and to the extent that they are, the O’Higgins PCR’s experts will make use of them as appropriate to supplement and inform their analysis, as set out in detail in the following section D on damages methodology.¹⁷ The O’Higgins PCR will give consideration to whether obtaining such data is necessary and desirable following disclosure from the Defendants. The O’Higgins PCR’s methodology does not, however, assume that such data will be available, in particular because: (i) it may not be possible to obtain such data; and (ii) to the extent that such data can be obtained, it may be of limited relevance if it does not properly represent trading carried out by members of the proposed class. The O’Higgins PCR’s experts’ damages methodology can be carried out even if third-party data is not

¹⁶ See Breedon 1, paragraph 6.36 {MOH-B/0/64}.

¹⁷ Breedon 3, paragraphs 5.10–5.15 {C/3/47-51}.

available, as explained in the following section.

D. DAMAGES METHODOLOGY

19. In a cartel damages case, an economic expert seeks to quantify the difference between the net amount actually paid for products purchased, and the net amount purchasers would have paid for the same quantities absent the conduct (the counterfactual). To perform this calculation, the expert needs: (i) an estimate or estimates of overcharges (defined as the cartel's impact on the amount paid per unit); (ii) the volume of relevant commerce; and (iii) the value of potential adjustments to gross damages. Each of these is addressed in turn below.

D1. Overcharge

20. The O'Higgins PCR's experts propose regression analysis as their primary method for estimating cartel overcharges. Regression analysis allows the economic analyst to determine the relationship between the average value of a "dependent variable" (such as price) and a set of "explanatory variables" (such as market conditions).
21. The relevant product in these proceedings is the provision of transaction services by FX dealers. FX dealers earn remuneration for these services in the form of a bid-ask spread. Because the spread is the price of the relevant product, it plays the role of the dependent variable in the proposed regression analysis of cartel overcharges.¹⁸
22. The experts plan to study two measures of spread: effective half-spread and realised half-spread.
 - (1) The experts will calculate effective half-spread as the difference between the execution price and the mid-price at the time of the trade's execution.¹⁹
 - (2) The O'Higgins PCR expects the defendants to disclose data on executed trades. As noted above, the experts will also use non-defendant data on executed trades if it is available, but this is not necessary. The experts will construct market mid-prices using data provided by companies that operate inter-dealer platforms, such as EBS

¹⁸ Bernheim 1, section II.A.1 {MOH-H/0/10-13}.

¹⁹ Breedon 1, paragraph 6.13 {MOH-B/0/56-57}; Bernheim 1, paragraph 118 {MOH-H/0/42}.

and Refinitiv (previously Reuters). Experts in the US proceedings have had access to these data (via subpoena), and it is understood that some may also be available for purchase for use in litigation (e.g. in the case of Refinitiv).²⁰

- (3) The experts will calculate realised half-spread analogously, using a mid-price shortly after the trade. Unlike the effective half-spread measurement, the realised half-spread measurement accounts for the price impact of the trade.²¹ The price impact is the tendency for the market price to rise after a buy order and fall after a sell order (i.e., it is a price move which will tend to inflict a loss on the dealer). The realised half-spread measurement is defined as the effective half-spread measurement, minus this price impact. Since many actions by the cartels may have involved minimising (or even reversing) price impact by passing that cost back to customers or other market participants, this adjustment is important in this case.
- (4) The appropriate time window for measuring realised spreads is long enough to ensure the price impact has mostly played out, but not so long that the noise caused by other market events makes the estimate imprecise. The experts will determine the appropriate time window by interrogating the data using accepted analytical methods employed in the microstructure literature.²²
- (5) The advantage of studying the effective half-spread is that it directly captures the damages resulting from conduct that widened quoted spreads. The advantage of studying the realised half-spread as well is that it also captures the damages associated with any systematic effects of the cartels on market mid-prices, either when the transaction occurred or immediately following it. For example, the coordinated trading conduct identified by the Settlement Decisions falls into this category because it moves the market mid-price at the time of the transaction. So do information exchanges which create informational advantages for cartel dealers, because the transactions of informed traders anticipate upcoming price movements. Effective spreads are incapable of measuring these effects.²³

²⁰ Breedon 1, paragraph 6.41 {MOH-B/0/65}; Bernheim 1, paragraph 126 {MOH-H/0/44-45}.

²¹ Breedon 1, paragraph 6.13 {MOH-B/0/56-57}; Bernheim 1, paragraph 121 {MOH-H/0/43}.

²² Breedon 3, paragraphs 4.31 and 4.34 {C/3/41-42}.

²³ Breedon 3, paragraph 4.14(b) {C/3/33}; Bernheim 3, paragraph 11 {C/4/8}.

- (6) Different types of trades may have different price impacts. For example, the price impact of orders at benchmark “fixes” may differ from the impact of standard market orders of the same size. If certain types of trades systematically have lower price impact, it is likely that effective spreads for that type of trade will be narrower. Thus, effective spreads may vary across trade types even if realised spreads do not, making realised spreads a more appropriate metric for comparing different types of trade.
23. Regarding explanatory variables, the experts plan to use measures of (and in some cases proxies for) factors that may have influenced the magnitudes of spreads to a significant degree during non-collusive periods. Their empirical investigation will encompass demand factors, factors that influence dealer costs such as operating costs and inventory risks, and general industry conditions. Information on many of these variables is available from public sources. It is expected that the defendants’ disclosure will likely contain either data on the other pertinent variables or information sufficient to construct them.²⁴
24. The O’Higgins PCR’s proposed class definition provides for the inclusion of limit or resting orders and benchmark trades. The experts’ regression sample will include them, but where appropriate will allow for the possibility that the cartels’ impact, as well as the effects of market conditions, varied across types of transactions. To the extent the cartels did not adversely affect some of the transactions within a category, or even caused a gain to a class member in respect of a specific transaction, the regression will include these effects, and consequently the experts’ estimate of overcharges will accurately reflect the overall classwide average for the transaction category.²⁵ (As noted at paragraph 9 above, however, the experts expect that, in respect of each individual class member, it is likely that they will have lost out overall once the effects of the cartels on all of their trades are averaged out.)
25. Prior to seeing the data, it is premature for an expert to commit to a particular regression specification. The experts plan to undertake a collection of regression analyses, and to evaluate their statistical performance and robustness.²⁶

²⁴ Bernheim 1, section III.B {MOH-H/0/45-48}.

²⁵ Bernheim 1, paragraph 145 {MOH-H/0/53}; Bernheim 2, paragraph 13 {C/2/10}.

²⁶ Bernheim 3, paragraphs 47 and 52-55 {C/4/20-24}; Breedon 1, paragraphs 6.45 and 6.47 {MOH-B/0/66-67}.

- (1) Models with multiple cartel dummy variables, as well as interactions between cartel dummy variables and other factors, can accommodate variation in the cartels' effectiveness over time and across categories of transactions. For example, they can allow for different effects on transactions: between counterparties (e.g. dealers who participated in the cartels compared with dealers who did not, based on variation in participation by defendant dealers over time if non-defendant transaction data is not available); between types of transactions (e.g. different currency pairs, trades of different sizes); or between types of orders (e.g. market, limit or resting, or benchmark), to the extent these are distinguishable in the data.²⁷
- (2) When formulating a model of spreads with multiple cartel dummy variables, the economic analyst must decide on the number of dummy variables (equivalently, the length of the time period each one represents), and the collection of interactions considered. Arriving at the best empirical specification requires careful interrogation of the data. Consideration of two extreme possibilities exemplifies the trade-offs:
 - (a) At one extreme, the analyst could use a model with a cartel dummy variable for each transaction. This approach is mathematically equivalent to the use of a prediction model. To compute overcharges with a prediction model, the analyst estimates the regression equation based only on data from the benchmark period (i.e., the period when a defendant was not a member of the cartels), and then using it to predict the price for each transaction during the cartel period.²⁸
 - (b) At the opposite extreme, the analyst could use a model with a single dummy variable. This approach assumes that the effect of the cartel was not correlated with any of the explanatory variables.²⁹
 - (c) Models with fewer cartel dummy variables and interactions impose restrictions on the data (by assuming that certain relationships hold), and the single cartel dummy variable model is the most restrictive case. Imposing the

²⁷ Bernheim 1, section II.B.1 {MOH-H/0/28-36}.

²⁸ Bernheim 1, section II.B.1 {MOH-H/0/28-36}.

²⁹ Bernheim 1, section II.B.1 {MOH-H/0/28-36}.

restrictions may increase ‘statistical precision’ if they are valid, but may reduce accuracy if they are not valid.³⁰

26. Regression analysis can reliably account for market events that occurred exclusively during the cartel period, and thereby avoid incorrectly attributing their effects to the cartel. For models with relatively few cartel dummy variables, the analyst adds controls for the pertinent events to the regression equation. For the prediction model, the analyst employs the method twice, once using data from outside the cartel period to predict prices but for collusion and the events, and once using data from inside the cartel period to measure the effect of the events. Combining these estimates isolates the effects of collusion.³¹
27. Appropriately deployed, regression methods can provide insight into the question of causality. These methods can either confirm or rule out the validity of innocuous explanations for price elevation which may suggest themselves or be offered by the defendants. Prediction models allow the economic analyst to make precise statistical statements, based on patterns observed outside the cartel period, about the probability that any collection of unspecified market factors, rather than the cartels, could have produced the estimated overcharges. The analyst can also study the relation between estimated cartel overcharges and indicators of collusive intensity, such as whether the transaction belongs to a category that the cartels particularly affected.³²
28. The experts plan to supplement the regression analysis of overcharges described above with additional analyses that draw on other data sources.
 - (1) Evidence from chatroom communications indicates that cartel dealers conspired to fix the spreads implied by their bid and ask quotes for certain currency pairs. It may be possible to analyse the impact of the cartels by studying bid-ask spreads from spread matrices exchanged by cartel dealers.³³

³⁰ Bernheim 1, paragraphs 89–90 {MOH-H/0/34}; Bernheim 3, paragraph 47 {C/4/20-21}; Bernheim teach-in testimony, pp. 95–96. Statistical precision refers to the variability of the estimator from its average.

³¹ Bernheim teach-in testimony, transcript p. 100.

³² Bernheim 1, paragraphs 74 {MOH-H/0/27} and 94 {MOH-H/0/35}; Bernheim 2, paragraph 67 {C/2/29}; Bernheim teach-in testimony, pp. 87–88, 110–111.

³³ Bernheim 1, section II.D.1 {MOH-H/0/40}.

- (2) It may also be possible to evaluate the impact of the cartels by analysing the revenue and/or profitability of the colluding dealers. To the extent that individual dealers were motivated by their bonuses, dealer profitability metrics may reflect the cartels' success. The defendants likely kept profit and loss data for individual traders' books, as well as for the trading desks as a whole, to measure their performance.³⁴
- (3) It may further be possible to corroborate the overcharge estimates using indicators for the intensity of the cartel activity. The experts assume they will obtain on disclosure a record of the chats from the Three Way Banana Split and Essex Express chatrooms, as noted above at paragraph 16(1). There may be methods to construct quantitative measures of cartel intensity based on these chats.³⁵

D2. Volume of commerce

29. The experts plan to quantify the volume of FX commerce with cartel dealers using the defendants' transaction data, by simply adding up the values of individual trades.³⁶
30. The volume of commerce for FX transactions with non-defendants can be estimated using information on aggregate market turnover for the relevant currencies, counterparties (those that are not reporting dealers), and types of contracts (spot and outright forward) along with information on the defendants' market share. Such data is available from, for example, BIS, Bank of England, or Euromoney.³⁷
31. To the extent that aggregate turnover is not available for some years, the experts can estimate it using turnover information from other years and general trends observed in defendants' data.³⁸

³⁴ Bernheim 1, section II.D.2 {MOH-H/0/40-41}.

³⁵ Bernheim teach-in testimony, pp. 110–111.

³⁶ Breedon 1, paragraph 6.53(a) {MOH-B/0/68}.

³⁷ Breedon 1, paragraphs 6.53(b), 6.54 {MOH-B/0/68} and 7.5–7.23 {MOH-B/0/71-77}.

³⁸ Breedon 1, paragraphs 7.5–7.23 {MOH-B/0/71-77}.

32. If data for some non-defendant dealers are available, the experts can use it to quantify the volume of commerce for those dealers and adjust the estimate based on aggregate market turnover accordingly.³⁹
33. As the O’Higgins PCR does not seek to exclude limit or resting orders and benchmark trades, the experts will not require information on the share of these transactions in aggregate market turnover, and they do not currently expect it to be available (at least in relation to limit or resting orders).⁴⁰ However, the experts may use information of this type if (i) it is available, and (ii) data availability permits them to calculate cartel damages separately for these classes of transactions using the approaches described above.
34. The O’Higgins opt-out class is necessarily limited to transactions by UK-domiciled entities. Volume-of-commerce estimates can be limited to such entities based on information expected to be available in the defendants’ data, survey results published by the Foreign Exchange Joint Standing Committee of the Bank of England, and Bank of England’s BIS Triennial Surveys.⁴¹
35. The experts will compute gross damages by applying the measured overcharges to the relevant commerce. If overcharge estimates differ by time period or by other identifiable characteristics of trades, the experts will match each trade or set of trades with the appropriate overcharge.⁴²

D3. Potential adjustments

(a) Pass-on

36. The experts plan to quantify ‘traditional’ pass-on for non-financial customers using aggregate or industry-specific estimates of exchange rate pass-on from the academic literature, and potentially by conducting additional empirical analyses based on the analytical methods deployed in that literature.⁴³ They will then calculate the weighted

³⁹ Breedon 1, paragraph 6.55 {MOH-B/0/69}.

⁴⁰ Breedon 3, paragraphs 3.20–3.22 {C/3/26-27}.

⁴¹ Breedon 1, paragraphs 6.49 {MOH-B/0/67} and 7.43–7.46 {MOH-B/0/82-83}, and exhibits J {MOH-B/15}, L {MOH-B/17} and M {MOH-B/18}.

⁴² Breedon 1, paragraphs 7.40–7.42 {MOH-B/0/80-82}; Bernheim 1, paragraph 113 {MOH-H/0/40}.

⁴³ Bernheim 1, paragraphs 163–164 {MOH-H/0/59-60}.

average classwide pass-on rate. They will derive the appropriate weights for UK industries using import/export statistics compiled by the UK government.⁴⁴

37. If necessary, in light of the first-instance *Allianz* judgment on the defendants' strike-out application ([2021] EWHC 399), the experts can calculate the classwide pass-on rate for financial customers using an approach that is conceptually analogous to the one employed for non-financial customers:⁴⁵
- (1) For some types of funds, redemptions by investors do not depend on the value of the fund, or the fund does not have investors. In these cases, the funds have themselves borne the damages and the pass-on rate is zero.
 - (2) For the types of funds where investor redemptions and withdrawals depend on the value of the fund, the experts plan to estimate the pass-on rate using information on each investment fund category's annual redemption or withdrawal rates. This information is likely available from, for example, the UK Financial Conduct Authority, third-party data vendors, and government regulatory agencies.
 - (3) The experts can use information from third-party sources such as The Investment Association, which publishes a breakout of UK assets under management by fund type, to calculate the relative weights for the different types of funds.

(b) Tax

38. As necessary, the experts will analyse the *change* in the applicable marginal tax rate between the cartel period and point in time at which the Respondents pay damages.⁴⁶
39. Information on statutory corporate tax rates is readily available. Information on the tax positions of individual class members primarily affects average tax rates rather than marginal tax rates, and consequently would not necessarily facilitate the computation of a more accurate tax adjustment, even if it were available.⁴⁷

⁴⁴ Bernheim 1, paragraph 165 {MOH-H/0/60}; Bernheim 2, paragraphs 23–24 {C/2/13} and 29 {C/2/15-16}.

⁴⁵ Bernheim 2, paragraphs 18–21 {C/2/11-13}.

⁴⁶ Bernheim 2, paragraph 46 {C/2/22}.

⁴⁷ Bernheim 2, paragraph 47 {C/2/22}.

D4. Potential apportionment between the two cartels

40. As necessary, the experts can apportion overall damages based, for example, on the relative shares of FX trading undertaken by the cartels.⁴⁸ If realised spreads materially differed between the cartels, the calculation can be adjusted to reflect this difference.⁴⁹

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⁴⁸ Breedon 2, paragraph 3.32 {C/1/24}.

⁴⁹ Breedon 2, paragraph 3.33 {C/1/24}.